

Lipid Disorders, Hypertension, Diabetes, and Weight Management

SECOND EDITION

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Academy of Nutrition and Dietetics
Pocket Guide to

Lipid Disorders, Hypertension, Diabetes, and Weight Management

Second Edition

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Chicago, IL

 Academy of Nutrition
and Dietetics

*Academy of Nutrition and Dietetics Pocket Guide to
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Management, Second Edition*

ISBN 978-0-88091-985-2 (print)

ISBN 978-0-88091-986-9 (eBook)

Catalog Number 447517 (print)

Catalog Number 447517e (eBook)

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Frequently Used Abbreviations

ACC	American College of Cardiology
ACEI	angiotensin-converting enzyme inhibitor
ADA	American Diabetes Association
AHA	American Heart Association
ARB	angiotensin receptor blocker
ASCVD	atherosclerotic cardiovascular disease
BG	blood glucose
BMI	body mass index
BP	blood pressure
CCB	calcium channel blocker
CF	correction factor
CHD	coronary heart disease
CKD	chronic kidney disease
CVD	cardiovascular disease
DASH	Dietary Approaches to Stop Hypertension
DB	diabetes
DBP	diastolic blood pressure
DGAC	Dietary Guidelines Advisory Committee
DHA	docosahexaenoic acid
DPP	Diabetes Prevention Program
DPP-4	dipeptidyl peptidase-4 inhibitor
DRI	Dietary Reference Intake
EAL	Evidence Analysis Library
EBNPG	evidence-based nutrition practice guideline
EHR	electronic health record

x Frequently Used Abbreviations

EPA	eicosapentaenoic acid
FDA	Food and Drug Administration
FPG	fasting plasma glucose
GDM	gestational diabetes mellitus
GFR	glomerular filtration rate
GI	glycemic index/gastrointestinal
GL	glycemic load
GLP-1	glucagon-like peptide-1
HbA1c	hemoglobin A1c
HDL-C	high-density lipoprotein cholesterol
HTN	hypertension
ICD	implantable cardioverter-defibrillator
IFG	impaired fasting glucose
J Acad Nutr Diet	Journal of the Academy of Nutrition and Dietetics
LD	lipid disorder
LDL-C	low-density lipoprotein cholesterol
MET	metabolic equivalent
MNT	medical nutrition therapy
NCP	Nutrition Care Process
eNCPT	Nutrition Terminology Reference Manual (eNCPT): Dietetics Language for Nutrition Care
NLA	National Lipid Association
NNS	nonnutritive sweetener
OGTT	oral glucose tolerance test
PA	physical activity
PES	problem, etiology, and signs and symptoms

PG	plasma glucose
PreDB	prevention of diabetes
PWM	pediatric weight management
RDN	registered dietitian nutritionist
RMR	resting metabolic rate
SBP	systolic blood pressure
SFA	saturated fatty acid
SGLT2	sodium-glucose cotransporter 2
T1D	type 1 diabetes
T2D	type 2 diabetes
TC	total cholesterol
TEE	total energy expenditure
USDA	US Department of Agriculture
WC	waist circumference
WM	weight management

Criteria for the Rating of Recommendations

Academy of Nutrition and Dietetics Evidence-Based Nutrition Practice Guidelines¹

- Strong** The workgroup believes that the benefits of the recommended approach clearly exceed the harms (or the harms clearly exceed the benefits in the case of a strong negative recommendation) and the quality of the supporting evidence is excellent or good (grade I or II). Practitioners should follow a **Strong** recommendation unless a clear and compelling rationale for an alternative approach is present.
- Fair** The workgroup believes that the benefits exceed the harms (or the harms clearly exceed the benefits in the case of a negative recommendation), but the quality of the evidence is not as strong (grade II or III). Practitioners should generally follow a **Fair** recommendation but remain alert to new information and be sensitive to client preferences.
- Weak** The quality of the evidence that exists is either suspect or well-done studies (grade I, II, or III) show little clear advantage to one approach vs another. Practitioners should be cautious in deciding whether to follow a **Weak** recommendation and should exercise judgment and be alert to emerging publications that report evidence. Client preference should have a substantial influencing role.
- Consensus** The expert opinion (grade IV) supports the guideline recommendation even though the available scientific evidence did not present consistent results, or controlled trials were lacking. Practitioners should be flexible in deciding whether to follow a **Consensus** recommendation. Client preference should have a substantial influencing role.

Continued on next page.

Insufficient evidence There is a lack of pertinent evidence (grade V) and/or an unclear balance between benefits and harms. Practitioners should exercise judgment in deciding whether to follow an **Insufficient Evidence** recommendation and be alert to emerging evidence that clarifies benefit vs harm. Client preference should have a substantial influencing role.

National Heart, Lung, and Blood Institute's Evidence-Based Methodology Panel Rating System²⁻⁵

- A** Strong recommendation: There is high certainty based on evidence that the net benefit is substantial.
- B** Moderate recommendation: There is moderate certainty based on evidence that the net benefit is moderate to substantial, or there is high certainty that the net benefit is moderate.
- C** Weak recommendation: There is at least moderate certainty based on evidence that there is a small net benefit.
- D** Recommendation against: There is at least moderate certainty based on evidence that it has no net benefit or that risks and/or harms outweigh benefits.
- E** Expert opinion: Net benefit is unclear. Balance of benefits and harms cannot be documented because of no evidence, insufficient evidence, unclear evidence, or conflicting evidence, but the Work Group thought it was important to provide clinical guidance and made a recommendation. Further research is recommended in this area.
- N** No recommendation for or against: Net benefit is unclear. Balance of benefits and harms cannot be determined because of no evidence, insufficient evidence, unclear evidence, or conflicting evidence, and the Work Group thought no recommendation should be made. Further research is needed in this area.

Note: This rating system is used by the American Heart Association/American College of Cardiology, National Lipid Association, Eighth Joint National Committee Evidence-Based Guideline for the Management of High Blood Pressure in Adults, and the American College of Sports Medicine.²⁻⁵

American Diabetes Association Evidence-Grading System⁶

- A Clear evidence from well-conducted, generalizable randomized controlled trials that are adequately powered
 - B Supportive evidence from well-conducted cohort studies
 - C Supportive evidence from poorly controlled or uncontrolled studies
 - E Expert consensus or clinical experience
-

Endocrine Society⁷

- 1 Strong recommendation, uses phrase "we recommend"
 - 2 Weak recommendation, uses phrase "we suggest"
-

Preface

Lipid disorders, hypertension, diabetes, overweight, and obesity are common medical problems. Registered dietitian nutritionists (RDNs) and other health professionals see clients with these conditions, or combinations of these conditions, daily. Food (nutrition therapy) and medications are important partners in their management. To assist RDNs in providing high-quality, evidence-based nutrition care, this pocket guide addresses nutrition care for each of these conditions. The purpose of this pocket guide is to integrate information from various Academy of Nutrition and Dietetics resources, including evidence-based nutrition practice guidelines (EBNPGs),¹ the Nutrition Terminology Reference Manual (eNCPT): Dietetics Language for Nutrition Care,² and the scope of practice for the RDN.³ The pocket guide does not replace these in-depth resources. Instead, it abbreviates the information and aims to help RDNs provide nutrition care for individuals with lipid disorders, hypertension, diabetes, and/or overweight or obesity. Because it is common to educate and counsel clients with more than one of these conditions, the pocket guide provides suggestions as to how to provide nutrition care for individuals with multiple medical problems. RDNs who work in clinic, inpatient, and public health settings will find the content of the guide to be useful in their clinical practice.

The publication of this guide would not be possible without the efforts and accomplishments of many others. The Academy of Nutrition and Dietetics has provided vision and support for the development of EBNPGs, the Nutrition Care Process (NCP), and standardized language. Without this support, none of these projects could have been achieved. Special mention must be given to Esther Myers, PhD, RD, FADA, and the Academy staff for their guidance and persistence in the development of standardized language and

the NCP. The dietetics profession is indebted to all of the many members who contributed and continue to contribute, to EBNPGs and the NCP, which together provide the framework for nutrition care. Guidance and support for EBNPGs is provided by the Academy of Nutrition and Dietetics Evidence-Based Practice Committee. They oversee the evidence analysis process, maintenance of the Evidence Analysis Library, and the development of all Academy EBNPGs and toolkits. We thank the many Academy members who have contributed their expertise and time to these projects. In particular, we acknowledge Academy staff and the Academy member analysts without whom none of these projects would have reached completion.

We also express our sincere appreciation to the Academy's Publications, Resources, and Products team. Their vision, expertise, and support have made this updated guide possible. A very special word of appreciation and thanks to the reviewers for their suggestions and comments; we have incorporated them into the guide. To all who participated in the process and development of this guide, we express our sincere thanks and gratitude!

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Chapter 1

Evidence-Based Nutrition Practice Guidelines and the Nutrition Care Process

How to Navigate This Pocket Guide

This pocket guide is organized to follow the steps in the Nutrition Care Process (NCP)—nutrition assessment, nutrition diagnosis, nutrition intervention, and nutrition monitoring and evaluation.¹ Integrated with the NCP are the Academy of Nutrition and Dietetics evidence-based nutrition practice guidelines (EBNPGs) for lipid disorders,² hypertension,³ type 1 and type 2 diabetes,⁴ prediabetes,⁵ gestational diabetes,⁶ adult weight management,⁷ and pediatric weight management recommendations,⁸ which are published in the Evidence Analysis Library⁹ and the *Journal of the Academy of Nutrition and Dietetics*. Registered dietitian nutritionists (RDNs) can use this guide to find concise and essential information needed to plan, implement, monitor and evaluate, and document nutrition care provided in clinic, inpatient, and public health settings. In subsequent chapters, the relevant EBNPGs are noted in the parentheses using this key:

- **LD** = lipid disorders
- **HTN** = hypertension
- **DB** = diabetes
- **PreDB** = prevention of diabetes
- **GDM** = gestational diabetes mellitus
- **WM** = weight management

This guide draws primarily from two sources: the Academy's EBNPGs⁹ and the Nutrition Terminology Reference Manual (eNCPT): Dietetics Language for Nutrition Care.¹ The evidence analysis process used to develop the EBNPGs is a rigorous and systematic process for searching, analyzing, and summarizing research on a specific nutrition topic.¹⁰ From the evidence summaries and conclusion statements, evidence-based nutrition recommendations and guidelines are developed. In this pocket guide, recommendations from the EBNPGs are organized by the section of the NCP to which they apply—nutrition assessment (see Chapter 2), nutrition diagnosis (see Chapter 3), nutrition intervention (see Chapters 4 and 5), and nutrition monitoring and evaluation (see Chapter 6). EBNPG recommendations are rated as strong, fair, weak, consensus, and insufficient evidence. Definitions of the ratings are listed on pages xii–xiv.

Medical nutrition therapy (MNT) is provided by RDNs and is an evidence-based application of the NCP. The provision of MNT to a client may include one or more of the following: nutrition assessment and reassessment, nutrition diagnosis, nutrition intervention, and nutrition monitoring and evaluation, which typically results in the prevention, delay, or management of diseases and/or conditions.¹ *Nutrition therapy* is the term used when RDNs and/or other health professionals provide nutrition interventions.¹¹ This guide aids in the essential integration of MNT into the overall medical management of health problems.

To facilitate the integration of MNT with national guidelines, subsequent chapters include recommendations from the following organizations:

- American College of Cardiology (ACC)/American Heart Association (AHA) on the treatment of blood cholesterol and lifestyle management^{12,13}

- National Lipid Association (NLA) for the management of dyslipidemia and lifestyle recommendations^{14,15}
- Eighth Joint National Committee on Management of High Blood Pressure¹⁶
- American Diabetes Association (ADA) on diabetes management^{11,17,18}
- AHA/ACC/The Obesity Society the management of overweight and obesity in adults¹⁹
- NLA consensus statement on obesity, adiposity, and dyslipidemia²⁰
- Endocrine Society on pharmacological management of obesity²¹
- US Department of Health and Human Services on physical activity (PA) guidelines²²
- American College of Sports Medicine on PA interventions for weight loss and prevention of weight gain in adults²³

Chapter 2 integrates the EBNPGs into the first step in the NCP—nutrition assessment (and reassessment for follow-up nutrition care)—in which the RDN obtains and collects timely and appropriate data and analyzes and interprets the data with evidence-based standards. Chapter 3 reviews the second NCP step, nutrition diagnosis, which involves identifying and labeling nutrition-related problems, determining the problems' cause and contributing risk factors, clustering signs and symptoms, and defining the problems' characteristics. Examples of possible nutrition diagnoses and PES (problem, etiology, and signs and symptoms) statements for conditions are given.

Chapters 4 and 5 cover the third step in the NCP, nutrition intervention, which involves planning (formulating goals and determining plans of action) so that nutrition interventions are integrated into overall disease management and implementation (care delivered and action carried

out). Chapter 4 summarizes the planning and development of nutrition prescriptions for MNT as part of disease management. Chapter 5 summarizes the implementation of EBNPG recommendations related to nutrition education and outlines nutrition counseling strategies used to implement the nutrition prescription and recommendations and coordination of nutrition care.

Chapter 6 summarizes the critical fourth NCP step, nutrition monitoring and evaluation, which involves monitoring progress, measuring outcome indicators, and evaluating outcomes. This requires that RDNs know the effectiveness and potential outcomes of nutrition interventions for the treatment and prevention of chronic diseases. Documentation is also reviewed in Chapter 6.

Effectiveness of Medical Nutrition Therapy

Lipid Disorders

Elevated low-density lipoprotein cholesterol (LDL-C), total cholesterol (TC), triglyceride, and decreased high-density lipoprotein cholesterol (HDL-C) concentrations are risk factors for cardiovascular diseases (CVDs) including coronary heart disease (CHD), coronary artery disease, hypertension (HTN), and stroke.^{1,2} Scientific evidence strongly supports the effectiveness of MNT as a means to manage dyslipidemia and reduce risk factors associated with CVD. Cardioprotective nutrition therapy can reduce TC levels by 7% to 21%, LDL-C levels by 7% to 22%, and TG levels by 11% to 31%.² Clients who attend multiple RDN visits for MNT can reduce daily dietary fat intake by 5% to 8%, saturated fat intake by 2% to 4%, and energy intake by 235 to 700 kcal/d, all of which contributes to the positive outcomes cited.² The ACC/AHA lifestyle management

guidelines recommend advising adults who would benefit from lowering LDL-C levels to follow eating plans such as Dietary Approaches to Stop Hypertension (DASH), which is rich in fruits, vegetables, and low-fat dairy products and low in saturated and total fat content), the US Department of Agriculture Food Pattern (ie, the *2015–2020 Dietary Guidelines for Americans*), or the AHA nutrition guidelines. The guidelines report an achieved macronutrient intake of 5% to 6% saturated fat and 26% to 27% total fat with LDL-C concentration lowered by 11 to 13 mg/dL.¹³

Hypertension

MNT for HTN provided by RDNs using individual and group sessions reduces blood pressure (BP) in persons with HTN or pre-HTN.³ Reductions in systolic BP (SBP) of up to 10 mm Hg and in diastolic BP (DBP) of up to 6 mm Hg are reported when MNT is provided at least 2 to 3 times per year. These reductions have been sustained for up to 4 years when MNT is provided at least 2 to 3 times per year.³ Both a healthy eating pattern, such as DASH, and reduced sodium intake independently reduce BP. However, the BP-lowering effect is greater when the two are combined.³ The DASH eating pattern with a sodium range of 1,500 to 2,400 mg reduced SBP by 2 to 11 mm Hg and DBP by 0 to 9 mm Hg in overweight or obese adults with HTN regardless of anti-hypertensive medications.³ DASH plus weight loss reduced SBP 11 to 16 mm Hg and DBP 6 to 10 mm Hg. Furthermore, among adults at all BP levels, PA decreases SBP and DBP on the average by 2 to 5 mm Hg and 1 to 4 mm Hg, respectively.¹³

Diabetes

Type 1 diabetes (T1D) is primarily a disease of insulin deficiency, whereas type 2 diabetes (T2D) is a progressive disease that results from defects in insulin action (insulin

resistance) and insulin secretion (insulin deficiency). T2D is diagnosed when an individual's endogenous insulin is insufficient to overcome the insulin resistance and he or she develops hyperglycemia.¹⁷ Studies document that in adults with T1D, MNT provided by RDNs contributed to decreases in hemoglobin A1c (HbA1c) by 1.0% to 1.9% at 6 months.⁴ Ongoing MNT support maintained the reduced HbA1c levels at 1 year and in the Diabetes Control and Complications Trial throughout the 6.5 years of the trial. In adults with T2D, MNT provided by RDNs significantly lowered HbA1c by 0.3% to 2% at 3 months, and with ongoing MNT support, decreases were maintained or improved for more than 12 months.⁴ MNT effectiveness is influenced by the duration of diabetes and level of glycemic control. It has its greatest impact following the initial diagnosis but continues to be effective throughout the disease process. Outcomes of nutrition interventions are generally measurable in 6 weeks to 3 months, and evaluation by an HbA1c test should be done at this time. If a client's glycemic control has not clinically improved at 3 months, the RDN should contact the referral source and recommend the need for a change in medication(s).⁴ Studies in adults with T2D report that MNT also resulted in decreases in the doses and number of glucose-lowering medications used. In adults with T1D, although the number of insulin injections increased, HbA1c improved without an increase in total insulin amounts. Improvements in quality of life are also reported from MNT provided by RDNs.⁴

Lifestyle interventions can prevent or delay the development of T2D in persons with preDB. In the first 2.8 years of the Diabetes Prevention Program (DPP), diabetes incidence in high-risk adults was reduced 58% by intensive lifestyle intervention (a reduced-energy eating plan, PA, and weight-reduction targets) and 31% by metformin only compared with placebo.²⁴ The long-term positive impact of

the DPP intervention was reported in the 15-year follow-up. At this time point, a 27% reduction in diabetes onset was reported in participants in the original lifestyle-intervention arm.²⁵ Other prevention studies have also reported long-term reductions in diabetes incidence from lifestyle interventions.²⁶

Overweight and Obesity

Overweight and obesity are complex, multifactorial chronic diseases that develop from an interaction between genetics and the environment and are associated with increased morbidity and mortality.²⁷ An individual's health can improve with relatively modest weight losses of 5% to 10% of body weight.¹⁹ With nutrition therapy interventions in overweight or obese adults, average weight loss is maximal at 6 months, with smaller losses maintained for up to 2 years, during which treatment and follow-up usually tapers. Weight loss achieved by lifestyle techniques aimed at reducing daily energy intake ranges from 4 to 12 kg at 6 months. Thereafter, slow weight regain is observed, with total weight loss at 1 year of 4 to 10 kg and at 2 years of 3 to 4 kg.¹⁹

Planning Medical Nutrition Therapy Encounters

Multiple encounters between the RDN and a client are required to implement nutrition interventions that will facilitate the goals of nutrition therapy and achieve desirable outcomes. The EBNPGs for lipid disorders, HTN, diabetes, and weight management also provide encounter guidelines, which are described in the sections that follow. The rating of each recommendation is listed parenthetically after the recommendation (see pages xii–xiv for rating definitions). Note that for clients who present with multiple

health issues, the RDN must decide whether nutrition care can be provided by following the guidelines for the primary disease process or if additional encounters will be needed.

Lipid Disorder Encounters

- MNT provided by an RDN is recommended for clients with an abnormal lipid profile (see Table 2.1) and for all clients who have existing CHD. (Strong)²
- The RDN should provide more than two visits for MNT (three to six visits) lasting an average of 45 minutes (30 to 60 minutes per session) over 6 to 12 weeks. (Fair)²
- If a client is taking lipid-lowering medications, the RDN should provide three or more visits for MNT, averaging 45 minutes per session over a 6- to 8-week period to improve the client's lipid profile. (Fair)²

Hypertension Encounters

- MNT provided by an RDN is recommended to reduce BP in adults with HTN. (Strong)³
- To reduce BP in adults with HTN, the RDN should provide MNT encounters at least monthly for the first year. After the first year, the RDN should schedule follow-up sessions at least two to three times per year to maintain BP reductions. (Strong)³

Diabetes Encounters

- The RDN, in collaboration with other members of the health care team, should ensure that all at-risk overweight and obese adults are screened for diabetes. (Fair)^{4,11}
- The RDN, in collaboration with other members of the health care team should ensure that all adults with T1D and T2D are referred for MNT. Individuals who have diabetes should receive MNT to achieve treatment

goals, preferably by an RDN familiar with the components of diabetes MNT. (Strong)^{4,11}

- The RDN should implement three to six MNT encounters during the first 6 months and determine if additional MNT encounters are needed. (Strong)^{4,11}
- The RDN should implement a minimum of one annual MNT follow-up encounter. (Strong)^{4,11}

Weight Management Encounters for Adults

- The RDN, in collaboration with other health care professionals, administrators, and public policy decision-makers should ensure that all adult clients have at least annual height and weight measurements to calculate body mass index and waist circumference measurement to determine risk of CVD, T2D, and all-cause mortality. (Fair)⁷
- The RDN, in collaboration with other health care professionals, administrators, and public policy decision makers, should ensure that overweight or obese adults are referred to an RDN for MNT. (Fair)⁷
- For weight loss, the RDN should schedule at least 14 MNT therapy encounters over a period of at least 6 months. (Strong)⁷
- For weight maintenance, the RDN should schedule at least monthly MNT encounters over a period of at least 1 year. (Strong)⁷
- If the RDN incorporates telenutrition interventions for weight maintenance, MNT may consist of either in-person or non-in-person encounters. (Strong)
- For older adults (age 65 and older) who are overweight or obese, the RDN should provide MNT for weight loss and maintenance. (Fair)⁷

Prioritizing and Combining Medical Nutrition Therapy for a Healthy Eating Pattern

Regardless of the disease state, a healthy eating pattern is recommended. The *2015–2020 Dietary Guidelines for Americans*²⁸ recommends eating healthfully across the life span with a focus on variety, nutrient density, and amount. A healthy eating pattern with an appropriate energy level is higher in vegetables, fruits, whole grains, seafood, and nuts; moderate in low- or nonfat dairy products and alcohol (among adults); lower in red and processed meat; and limits sweets, sugar-sweetened foods and drinks (sugar-sweetened beverages), and refined grains. Added sugars should be less than 10% of calories per day, saturated fat less than 10% of calories per day, and sodium less than 2,300 to 2,400 mg/d. Eating patterns must be tailored to the individual's biological and medical needs, as well as socio-cultural preferences.^{13,28}

For persons with lipid disorders, initial MNT recommendations are for 25% to 35% of energy intake from total fat, less than 7% of energy intake from saturated fatty acids and *trans* fatty acids, and less than 200 mg of food cholesterol per day (other recommendations from professional organizations have not recommended a specific restriction on food cholesterol).² If HTN is a concurrent problem, a sodium intake limited to no more than 2,300 to 2,400 mg/d (some individuals may benefit from a further reduction to 1,500 mg/d) and a DASH eating pattern are recommended.³

For people with T1D, T2D, or gestational diabetes mellitus, MNT begins with interventions shown to improve glycemic outcomes.^{4,6} Glucose control improves soon after MNT is implemented, and these improvements encourage individuals to continue lifestyle interventions. A variety of interventions (individualized nutrition therapy, energy

restriction, carbohydrate counting, portion control, sample menus, exchange lists, simplified meal plans, healthy food choices, low-fat vegan, insulin-to-carbohydrate ratios, PA, and behavioral strategies)⁴ and eating patterns¹¹ have been shown to be effective. For people with T2D, all interventions resulted in a reduced energy intake. People with diabetes frequently also have lipid disorders and HTN. MNT interventions for these problems should also be implemented in the initial series of encounters.

Lifestyle changes that produce even modest, sustained weight loss of 3% to 5% produce clinically meaningful reductions in TGs and lower risk of developing T2D. Greater amounts of weight loss will reduce BP and HbA1c levels, improve LDL-C and HDL-C values, and reduce the need for medications to control BP, blood glucose (BG) levels, and lipid levels as well as further reduce TG and BG values.¹⁹ Therefore, an energy-controlled eating pattern and regular PA are important components of MNT for these conditions.

Conclusion

When clients have only one medical diagnosis, disease-specific recommendations are available in the Academy's Evidence Analysis Library.⁹ A major goal of this pocket guide, however, is to help RDNs integrate the EBNPGs for LD, HTN, DB, preDB, and adult WM into individualized nutrition care for clients who have multiple medical diagnoses. Along with information from the referral source, laboratory data, the individual's food and nutrition history, and client preferences, the RDN can use this pocket guide to prioritize nutrition therapy interventions that will be most effective in reducing risk of disease complications.

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Appendix A

Useful Formulas

Non-High Density Lipoprotein Cholesterol

$$\text{Non-HDL-C}^\dagger = \text{TC}^\ddagger - \text{HDL-C}$$

Calorie Content

$$1 \text{ g carbohydrate} = 4 \text{ kcal}$$

$$1 \text{ g protein} = 4 \text{ kcal}$$

$$1 \text{ g fat} = 9 \text{ kcal}$$

$$1 \text{ g alcohol} = 7 \text{ kcal}$$

Calorie Conversion

$$1 \text{ kcal} = 4.184 \text{ kJ}$$

Hemoglobin A1c Conversion

$$\text{HbA1c}^\S (\text{mmol/mol}) = [\text{DCCT}^\P \text{HbA1c} (\%) - 2.15] \\ \times 10.929$$

† HDL-C = high-density lipoprotein cholesterol

‡ TC = Total Cholesterol

§ HbA1c = Hemoglobin A1c

¶ DCCT = The Diabetes Control and Complications Trial

Conversions**Système International (SI) Units and Conventional Units**

Glucose: _____ mg/dL \times 0.0555 = _____ mmol/mol

Cholesterol: _____ (mmol/mol \times 38.7) = _____ mg/dL

Cholesterol: _____ mg/dL \times 0.02586 = _____ mmol/mol

Triglycerides: _____ (mmol/mol \times 88.6) = _____ mg/dL

Triglycerides: _____ mg/dL \times 0.0112 = _____ mmol/mol

Insulin: _____ (mmol/mol \div 6.0) = _____ mcIU/mL

C-peptide: _____ (mmol/mol \times 3.03) = _____ ng/mL

Sodium: _____ mmol \times 23 = _____ mg

Sodium chloride: _____ mmol \times 28 = _____ mg

Potassium: _____ mmol \times 39 = _____ mg

Calcium: _____ mmol \times 40 = _____ mg

Vitamin D (25[OH]D): _____ ng/mL \times 2.496 = _____ nmol/L

Vitamin D (25[OH]D): _____ ng/mL \times 0.4 = _____ ng/mL

Conventional to Metric Conversions

1 inch = 2.54 cm

1 lb = 0.4536 kg

1 oz = 28.35 g

1 fl oz = 29.57 mL

1 g = 0.0353 oz

1 g = 0.0022 lb

1 kg = 2.21 lb

1 liter = 1.1 quart

Other Commonly Used Formulas

Body Mass Index

BMI** = Weight (kg)/Height (m)²

BMI = [Weight (lb)/Height (in)²] × 703

Mifflin-St Jeor Equation for Estimated Resting Metabolic Rate

When indirect calorimetry is not possible, the Mifflin-St Jeor equation is recommended for estimating resting metabolic rate (RMR) in overweight and obese individuals. Use actual weight to derive the most accurate estimate.¹

Men: RMR = (10 × Weight) + (6.25 × Height)
– (5 × Age) + 5

Women: RMR = (10 × Weight) + (6.25 × Height)
– (5 × Age) – 161

Where: Weight is measured in kg; height in cm;
age in years.

** BMI = Body Mass Index

Estimated Calorie Requirements for Adults

Indirect calorimetry or the Mifflin-St Jeor equation plus Dietary Reference Intake physical activity factors (see Box 2.11) are recommended for energy calculations. Although not as accurate for a quick estimation of approximate energy requirement in adults, Table A.1 may be considered for use.

Table A.1 Estimating Approximate Energy Requirement for Adults Based on Actual Weight

Obese or very inactive individuals and chronic dieters	10–12 kcal/lb (20 kcal/kg)
Individuals > 55 y, active women, sedentary men	13 kcal/lb (25 kcal/kg)
Active men, very active women	15 kcal/lb (30 kcal/kg)
Very active men	20 kcal/lb (40 kcal/kg)

Estimating Energy Needs for Youth by Age, Sex, and Physical Activity Level

Energy should provide for normal growth and development in children and adolescents. To determine normal growth and weight profiles, the growth of youth should be monitored on Centers for Disease Control and Prevention pediatric growth charts (www.cdc.gov/growthcharts).

Table A.2 lists approximate caloric requirements for children and adolescents based on sex, age, and PA level from the US Department of Health and Human Services and US Department of Agriculture.²

Table A.2 Estimating Caloric Requirements for Youth^{a,2}

Sex	Age (years)	Physical Activity Level ^a		
		Sedentary ^b	Moderately Active	Active
Child (female and male)	2–3	1,000–1,200 ^c	1,000–1,400 ^c	1,000–1,400 ^c
Female	4–8	1,200–1,400	1,400–1,600	1,400–1,800
	9–13	1,400–1,600	1,600–2,000	1,800–2,200
	14–18	1,800	2,000	2,200
Male	4–8	1,200–1,400	1,400–1,600	1,600–2,000
	9–13	1,600–2,000	1,800–2,200	2,000–2,600
	14–18	2,000–2,400	2,400–2,800	2,800–3,200

^a Based on Estimated Energy Requirements equations, using reference heights (average) and reference weights (healthy) for each age/sex group. Estimated amounts of calories needed to maintain calorie balance for various sex and age groups at three different levels of physical activity are shown. The estimates are rounded to the nearest 200 calories.

^b Sedentary is a lifestyle that includes only light physical activities associated with the typical day-to-day life. Moderately active is a lifestyle that includes PA equivalent to walking about 1.5–3 miles/d at 3 to 4 mph. Active is a lifestyle that includes physical activity equivalent to walking >3 miles/d at 3–4 mph, in addition to the light physical activity associated with typical day-to-day life.

^c The calorie ranges shown accommodate needs of different ages within the group. For children and adolescents, more calories are needed at older ages.

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Lipid Disorders, Hypertension, Diabetes, and Weight Management

SECOND EDITION

This pocket guide integrates evidence-based nutrition practice guidelines for lipid disorders, hypertension, diabetes, prediabetes, and weight management into individualized nutrition care for clients with multiple medical diagnoses. Use this guide to prioritize nutrition interventions that will be most effective in reducing risk of disease complications.

The latest authoritative guidelines are addressed, including recommendations from the Evidence Analysis Library, American Heart Association, American College of Cardiology, Eighth Joint National Committee, National Lipid Association, American Diabetes Association, Obesity Society, Dietary Guidelines Advisory Committee. Organized according to the Nutrition Care Process, this comprehensive guide includes assessment tools, sample PES (problem, etiology, and signs and symptoms) statements, guidelines for nutrition education, and more. Handy appendixes with common formulas and tools make this a true, one-stop pocket guide.

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ISBN 9780880919852



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CatN 447517